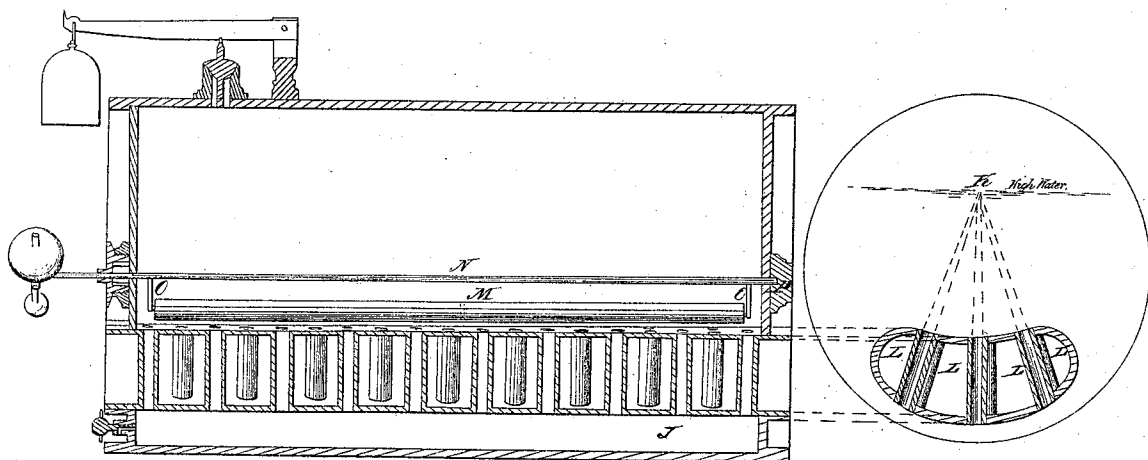
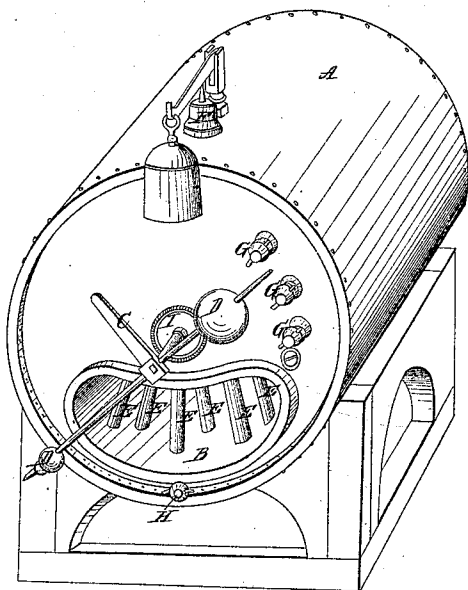


*S. Graham,*  
*Steam-Boiler Fire-Tube.*  
*N<sup>o</sup> 609.* *Patented Feb. 15, 1838.*



# UNITED STATES PATENT OFFICE.

SETH GRAHAM, OF ROXBURY, MASSACHUSETTS.

## IMPROVEMENT IN REGULATORS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 609, dated February 15, 1838.

*To all whom it may concern:*

Be it known that I, SETH GRAHAM, of Roxbury, in the county of Norfolk and Commonwealth of Massachusetts, have invented a new and useful Improvement in the Use of the Steam-Boiler; and I do hereby declare that the following is a full and exact description of the same.

The nature of my invention consists in providing steam-boilers with conical pipes so arranged that they will convey the water while heating from the bottom to the top of the boiler through the generator, and also with water-regulator so constructed and connected with the pump as to keep at all times nearly the same quantity of water in the boiler.

All the parts of this my invention are represented by the two drawings hereto annexed.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

I construct my boiler with the furnace (marked F upon the drawings) under it and the flue through it from end to end. It is marked A upon the drawings, and is in the common form, has gage-cocks, a safety-valve, and the other appendages of such boilers. It is supplied with water in the usual way by means of a forcing-pump. The bottom of the flue is about four inches from the bottom of the boiler, and occupies in width about one-third of its circle, and in height one-fourth of its diameter. Metallic pipes of a conic form, (marked E upon the drawings,) about two inches in diameter, are inserted across the flue, passing from the bottom toward the top of the boiler. They are in nearly a perpendicular position and arranged in six straight transverse rows extending from one end of the flue to the other, forming four transverse flues or openings (marked L upon the drawings) about four inches wide at the bottom and about three at the top. By this arrangement a better draft is obtained, and the fire operates with greater power upon the pipes and flue, and the pipes and the flue can be conveniently cleaned, and salt-water may be therefore safely used. The water passes freely through the pipes from one part of the boiler to the other. As the pipes are conical, they can by means of screws upon them be easily and safely inserted and re-

paired. The flue thus provided with pipes (marked B upon the drawings) I call the "generator." When the fire is kindled in the furnace, the flame and heat pass under the boiler and back through the flues of the generator and operate with great power upon the water in the pipes. It immediately rises in them and passes rapidly toward the top of the boiler, and at the same time the water which is less exposed to the action of the heat descends toward the bottom, and there is a considerable motion of the water up through the pipes and down by the sides of the generator.

The water-regulator consists of an iron or other metallic shaft (marked N upon the drawings) a little longer than the boiler, an air-chamber (marked M upon the drawings) a little shorter than the boiler, composed of thin metallic substance of the form of a cylinder, air-tight and so light as to float upon the surface of the water, and two arms of iron or other metal (marked O upon the drawings) in length a little less than the semi-diameter of the boiler. These connect the two ends of the air-chamber with the shaft.

To preserve the air-chamber in its proper shape, rings should be placed inside of it at the distance of about three or four feet from each other. The air-chamber thus connected with the shaft is placed in the boiler. One end of the shaft is inserted in the center of one end of the boiler, and the other end passes through the other end of the boiler in the center, and is so fixed as to be easily moved. When there is water in the boiler, the air-chamber floats upon its surface and turns the shaft as the water rises and falls. To prevent too much agitation of the air-chamber by the motion of the boiling water, a bar is fixed across that end of the shaft which passes through the end of the boiler, with a movable ball (marked D upon the drawings) upon each end of it. The bar is in length about equal to the diameter of the boiler, and the balls are so fixed as to be easily moved in order to preserve a proper balance in the regulator. There is also fixed to the end of the shaft an arm perpendicular to the bar, (marked C upon the drawings,) and the upper end of it is connected by means of a rod with the band or cock which regulates the

working of the pump. As the quantity of water in the boiler diminishes the air-chamber descends and causes the arm to incline in the same direction, and when it inclines from its perpendicular position the band is moved or the cock turned by means of the connecting-rod, in consequence of which the pump begins to work and forces the water into the boiler, and when by the increase of the quantity of water the air-chamber rises so as to bring the arm to its perpendicular position again the band is moved back or the cock turned back, whereby the pump ceases to work. The operation is such as to keep at all times nearly the same quantity of water

in the boiler. Consequently the steam is more rapidly generated, the dangers of bursting the boiler are greatly diminished, and safety from the communication of fire by heating the boiler is fully secured.

What I claim as my invention, and desire to secure by Letters Patent, is—

The water-regulator constructed and applied to steam-boilers in the manner hereinabove described.

Roxbury, June 21, 1837.

SETH GRAHAM.

Witnesses:

SHERMAN LELAND,  
CATHARINE LELAND.